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(*Under International Convention.*)

Date claimed for Patent under Patents Act, 1901, being date of first Foreign Application (in the United States), } 30th Nov., 1906

Date of Application (in the United Kingdom), 5th Nov., 1907

At the expiration of twelve months from the date of the first Foreign Application, the provision of Section 1 (2) of the Patents Act, 1901, as to inspection of Specification, became operative

Accepted, 5th Nov., 1908

COMPLETE SPECIFICATION.

Improvements in and relating to Vessel Construction.

We, WILLIAM WALLACE WOTHERSPOON, of No. 305 West 12th Street, New York, County and State of New York, United States of America, Civil Engineer, and ROBERT OWEN KING, of North Tonawanda, County of Niagara, State of New York, United States of America, Civil Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:

This invention relates to the construction of vessels, such as ships and floating dry-docks, the objects being to guard against the sinking of vessels, to provide for the raising of sunken vessels, and the removal and recovery of stranded vessels.

The invention consists primarily in constructing the holds or compartments of the vessel so that they may at will be rendered air-tight or substantially so; providing each with an air-lock, and arranging for the introduction of air under pressure into the compartments, in order to expel any water which may have entered therein.

In carrying our invention into effect in its application particularly to power-driven vessels, such as steam-ships, the various compartments of the hull, such as the holds, the engine and boiler rooms, the coal bunkers, tunnels, ballast tanks, and so forth, are so formed that the ordinary passages of communication with the outside, may be closed air-tight or practically so in order that air introduced therein under pressure may be compressed sufficiently to force out any water entering the hull. In connection with the compartments, air-locks are provided to enable workmen to enter the same from the outside, while the pressure is maintained, in order to repair the leaks; and an air-compressing plant is provided, connected by controllable communications with the various compartments; whereby, in the event of leakage of water into any of the compartments, air may be forced therein to expel the same.

It has been heretofore proposed to provide a bifurcated tunnel fitted with double back pressure valves or doors and leading from an air-tight engine compartment to air-tight coal bunkers with the object of preventing water from entering one compartment from the other while at the same time permitting men to have access to one compartment from another. Also it has before been

[*Price* 8*d.*]

proposed to provide a sunken or leaking vessel with a temporary air-lock to enable workmen to enter the holds while the latter are placed under air-pressure, the hatchways being of course air-tight; also to provide a permanent equipment of air compressors and pipes to admit air under pressure individually into the holds or compartments, and to provide the pipes with valves to regulate the air pressure in the compartments; but according to this invention the holds or compartments of a sea-worthy vessel are each fitted with a permanent air-lock, or two adjacent holds or compartments are provided with a common permanent air-lock, and in a vessel with compartments provided with such permanent air-locks, air-tight hatchways and a permanent equipment of air compressors and pipes leading to the compartments are provided, which pipes admit air under pressure into the compartments, and reducing valves may be used to regulate the pressure of air in the compartments.

Referring to the drawings;—Figure 1 is a longitudinal section through the hull of a vessel having our invention applied thereto. Fig. 2 is a transverse vertical section of the same on the line *a—a* of Fig. 1. Fig. 3 is a sectional elevation showing a single air-lock formed to afford entrance to two adjacent compartments. Fig. 4 is a sectional elevation of a smokestack having an air-lock embodied therein. Fig. 5 is a sectional elevation of a form of reducing valve used to regulate the pressure admitted to the compartments. Fig. 6 is a top plan view of the preferred form of air-tight covering for the hatchway. Fig. 7 is a vertical section through the same on the line *b—b* of the preceding figure.

In the accompanying drawings, which represent only so much of a vessel as is necessary to illustrate the application and operation of our invention, A represents the hull, provided at its front and rear with holds or compartments B B, and so forth, intermediate of which is the engine room C and the boiler room D. As shown, the holds B are separated by vertical partitions *b*, while the engine room and boiler room are separated from each other by the vertical partition *d*, and they are separated from the adjacent holds B by vertical partitions *e*.

E represents hatches, closing hatchways as usual through the deck into the holds; and F F represent smoke-flues extending upward through the deck from the furnaces.

In applying our invention, the hatches are so formed, as by the provision of packing or otherwise, that they will close the hatchways air-tight or practically so; and in order to render the boiler room air-tight, means are provided for sealing the smoke-flues, either by the application of lids or caps *f* to their upper ends, or by other suitable means. So also any other of the usual openings communicating with the outside from the compartments, such as port holes, sky-lights, ventilating shafts, and so forth, are sealed air-tight, in order that air may be forced under pressure into the compartments and compressed sufficiently to expel any water which may have entered through a leak.

Air under pressure is introduced into the various compartments through a system of pipes leading thereto from an air-compressing plant G, situated preferably at the upper deck level, and comprising an air-compressing pump H and an operating engine I. The compressed air from the pump passes by vertical pipe K to a horizontal main distributing pipe L, from which main pipe, vertical branch pipes *n* lead downward and enter the compartments, each branch pipe being provided with a controlling valve n^1, by means of which the admission of air to the various compartments may be independently controlled.

Each of the compartments is provided with an air-lock O through which the workmen may enter the compartments while the pressure is maintained, for the purpose of repairing leaks. These air-locks consist as usual of a chamber having a door o^1 communicating with the outside, and a second door o^2 communicating with the interior of the compartment.

In the operation of our invention, if a leak occurs or a hole is stove in the

bottom of the hull, that compartment in which the leak occurs is closed air-tight, and the controlling valve n^1 in its branch n is opened. The compressing pump is then started, and air forced in, with the result that the water will be driven out through the hole in the bottom through which it entered. While the pressure of air is maintained in the leaking compartment, workmen may enter the same through the air-lock and make such repairs as are necessary, either permanent repairs, or such temporary repairs as would enable the vessel to be taken into port. In the event of the leak occurring or a hole being stove in the side of the hull, the pressure of air in the compartment will expel the water to a level corresponding with the top of the hole, and the hole may then be closed by the workmen from the inside, starting at the top of the hole and applying the covering gradually in a downward direction. The water remaining in the compartment may then be pumped out in the usual manner. By constructing the engine room as a separate compartment from the boiler room, if the leak occurs in the former only, there would be no interference with the operation of the engines after the engine room had been freed of water.

In order that the tops of the compartments in which the air is forced may be prevented from being strained by the internal pressure, we preferably employ vertical tie-rods S connected respectively with the tops and bottoms of the compartments. Or other appropriate means may be employed for this purpose. It will be understood that it is only necessary to construct such compartments, in the manner described, as are liable to injury, such as those at the sides and bottom of the hull; or only such compartments may be thus constructed as the filling of which by water would cause the vessel to sink. It will be understood also that the details of our invention may be variously modified and changed to meet the different conditions encountered in practice, as regards the type of vessel, the arrangement and construction of the holds or compartments, and other features peculiar to varying types of ship construction. For instance, other means than the tie-rods shown for strengthening the holds or compartments, may be employed for this purpose, for said compartments may be strengthened by appropriate braces applied externally. Furthermore instead of employing an air-lock for each compartment, the air-lock may be formed with a single entrance chamber and two branch chambers, communicating respectively with two adjacent compartments, as shown in Fig. 3. Here it will be seen that the entrance chamber 1, closed by a door 2 at its upper end communicates at its lower end with two branch tubes or chambers, 3 and 4, entering respectively two adjacent holds 5 and 6, the communication with these holds being controlled by doors 7 and 8.

Where the communication of the compartment with the outside is in the form of a ventilating funnel, the air-lock may be built in as a part of the same, as shown in Fig. 1. Here it will be seen that the tube forming a downward continuation of the swivelling funnel, is provided with an upper door 9 which may be exposed by lifting the funnel off, and it is further provided with a lower door 10. It is preferable to construct this tube with fittings so that the doors may be instantly applied, whenever the occasion arises. The air-lock may be similarly built in as a part of the smokestack, as illustrated in Fig. 4, where it will be seen that above the upper deck the smokestack is provided with a removable section or door 11, by which access may be had to its interior. Just below this section, and at about a level of the upper deck, the stack is provided with fittings for an upper air-lock door 12; and some distance below it is provided with similar fittings 13 for a lower air-lock door 13^x, which doors are preferably applied to their fittings to perform their functions, whenever it is desired, in a case of leakage, to introduce air pressure into the boiler room. Below the door 13 a second removable section 14 is provided in the stack, in order to permit the workmen entering through the air-lock to gain access to the boiler room.

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In the event of leakage into several holds or compartments, the degree of pressure of air necessary to expel the water may vary according to the location of the leak, the list of the vessel and other conditions, such as would cause different hydrostatic pressures. To meet these conditions, we propose to provide for adjusting the air pressure admitted to the several compartments, according to the resistance to be encountered. This may be conveniently effected by applying to each of the vertical pipes *n*, a reducing valve 15, which may be of any well known form, adjustable to different pressures. A valve of this character is illustrated in Fig. 5, and embodies a valve seat 16, communicating on opposite sides with the pipe *n*, against which seat a valve proper 17 closes. The valve proper is provided with a stem 18 extended through a stuffing box to the outside, and through a guide plate 20, a spiral spring 21 encircling the stem and bearing at one end against an adjusting nut 22, and at its opposite end against a head 23 on the stem. By adjusting this spring to different pressures, the incoming pressure of air may be correspondingly reduced as it passes by the valve.

In closing the hatchway air-tight, while this may be accomplished in various ways, we prefer to adopt the construction shown in Figs. 6 and 7, where it will be seen that the hatchway is closed by a sliding covering or door 25, adapted to fit beneath overhanging guides 26, a packing of rubber or equivalent material being interposed between the covering and the guides in order to form an air-tight joint. By the use of a covering of this character, the hatchway may be instantly closed air-tight when the occasion arises.

As shown by the dotted lines in Fig. 7, the air-lock may be applied to the sliding covering 25.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is;

1. A sea going craft or vessel having holds or compartments, as usual, which holds or compartments are permanently equipped with air-locks for the entrance of workmen into them, and which vessel is equipped with permanent means for closing air-tight or substantially so the usual communications of the compartments with the outside, such as hatches, funnels and the like, and a permanent equipment of air compressors and pipes leading to the several compartments with suitable valves; whereby at a moment's notice air under pressure may be turned on into any one or all of the compartments and workmen may enter into said compartments while the same are under pressure.

2. In combination with a vessel's hull, provided with an engine room and boiler room separated by a partition, means for rendering the engine room substantially air-tight, an air-lock communicating from above deck with the engine room, and means for forcing air under pressure into the engine room; whereby in the event of leakage into the engine room only, the operation of the engines may be continued after the water is expelled.

3. In combination with a vessel having compartments fitted with air-locks and air-supplies as claimed in Claim 1, means for adjusting the air pressure admitted to the several compartments according to the different hydrostatic pressures encountered therein substantially as described.

4. In combination with a vessel having compartments fitted with air-locks and air-supplies as claimed in Claim 1, a source of air pressure common to said compartments, individual connections between the source of air pressure and the compartments and reducing valves in said connections.

5. In a vessel having compartments fitted with permanent air-locks and air-supplies as claimed in Claim 1, an air-lock formed with one upper door or valve and two lower doors or valves giving access to adjoining compartments.

6. In a vessel having an air-lock for adjoining air-tight compartments as claimed in Claim 5 the bifurcated form of air-lock substantially as described.

7. In combination with a vessel's hull provided with a boiler room, a smoke

stack extending therefrom to the outside, two air-lock doors in said stack one above the other, a removable section in the stack above the air-lock door, and a second removable section in the stack communicating with the boiler room.

8. In a vessel, and in combination with the ventilating funnel and its shaft, upper and lower air-lock doors situated in said shaft.

Dated this 5th day of November 1907.

JENSEN & SON,
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Chartered Patent Agents.

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WOTHERSPOON & another's COMPLETE SPECIFICATION.

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[This Drawing is a reproduction of the Original on a reduced scale]

Fig. 4.

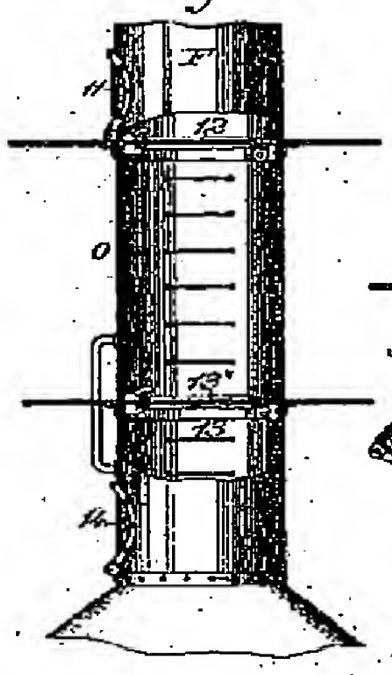

Fig. 3.

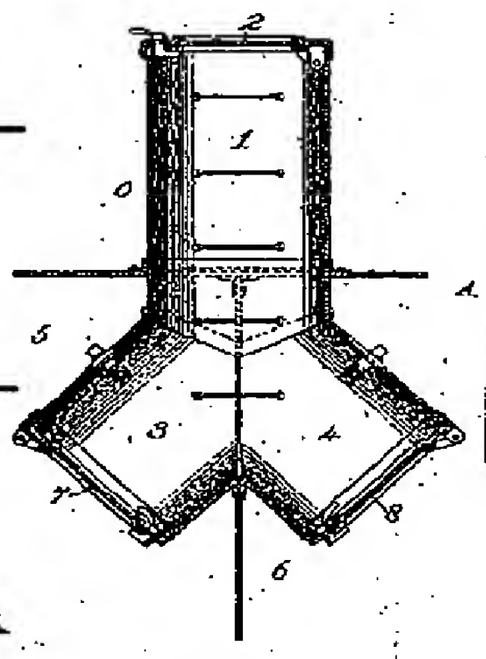

Fig. 2.

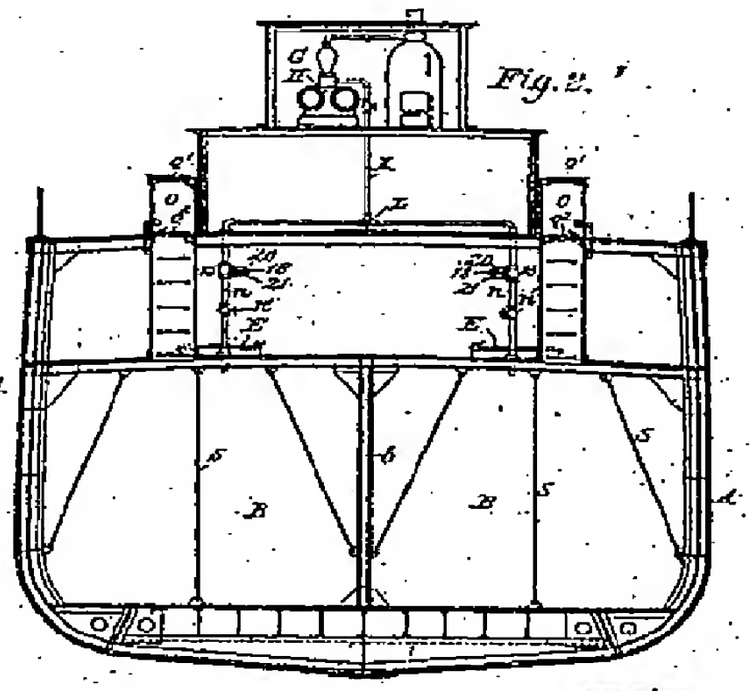

Fig. 1.

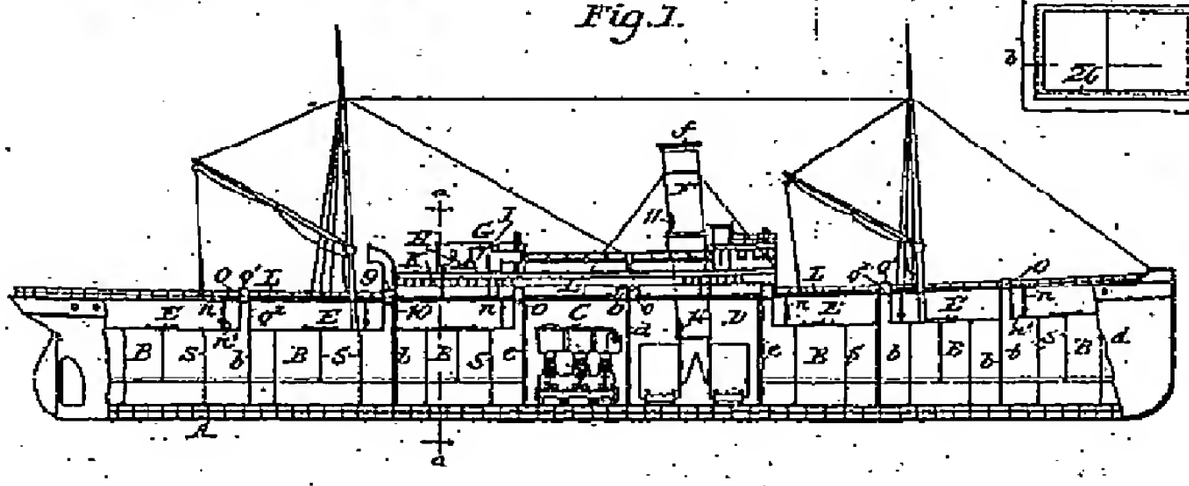

Fig. 6.

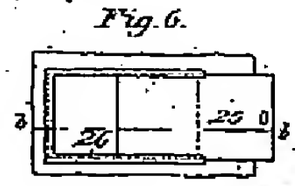

Fig. 5.

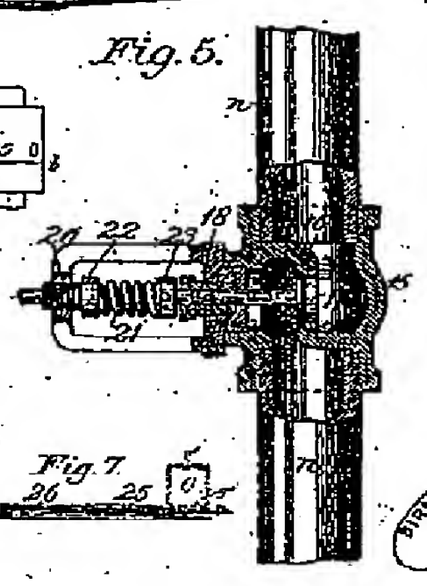

Fig. 7.

Malby & Sons, Photo-Litho.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 4.

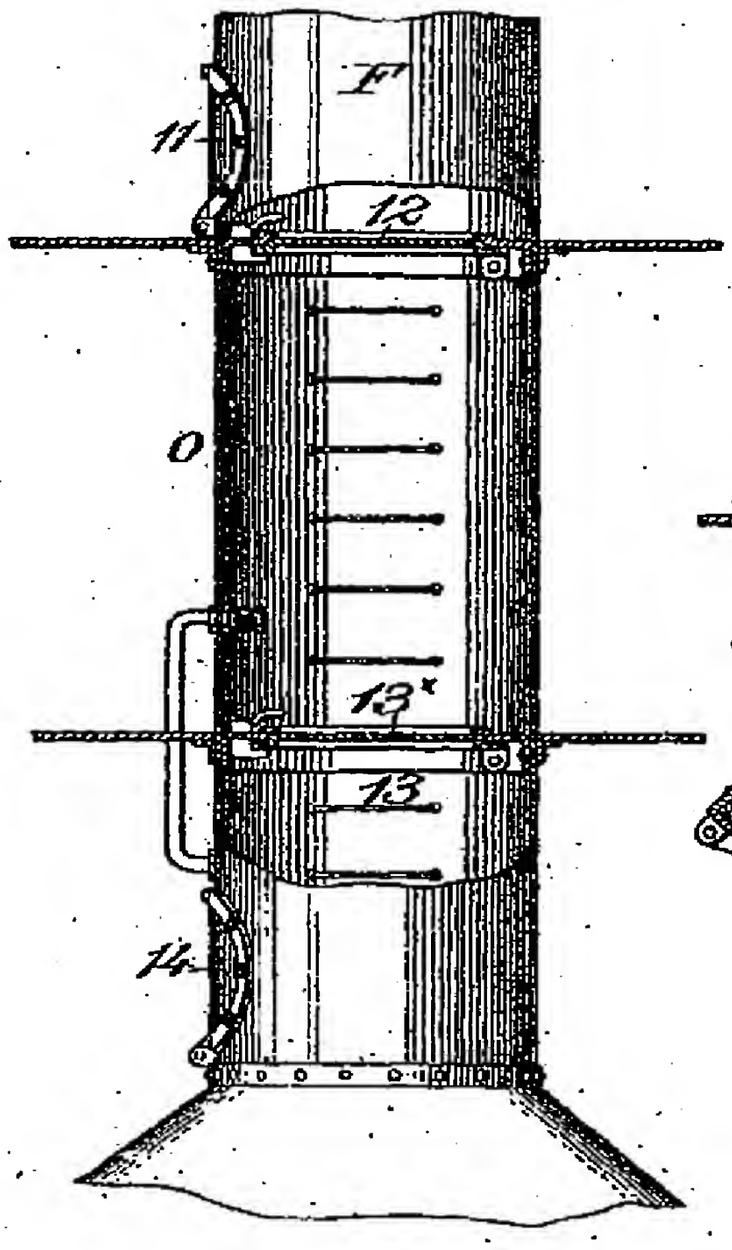

Fig. 3.

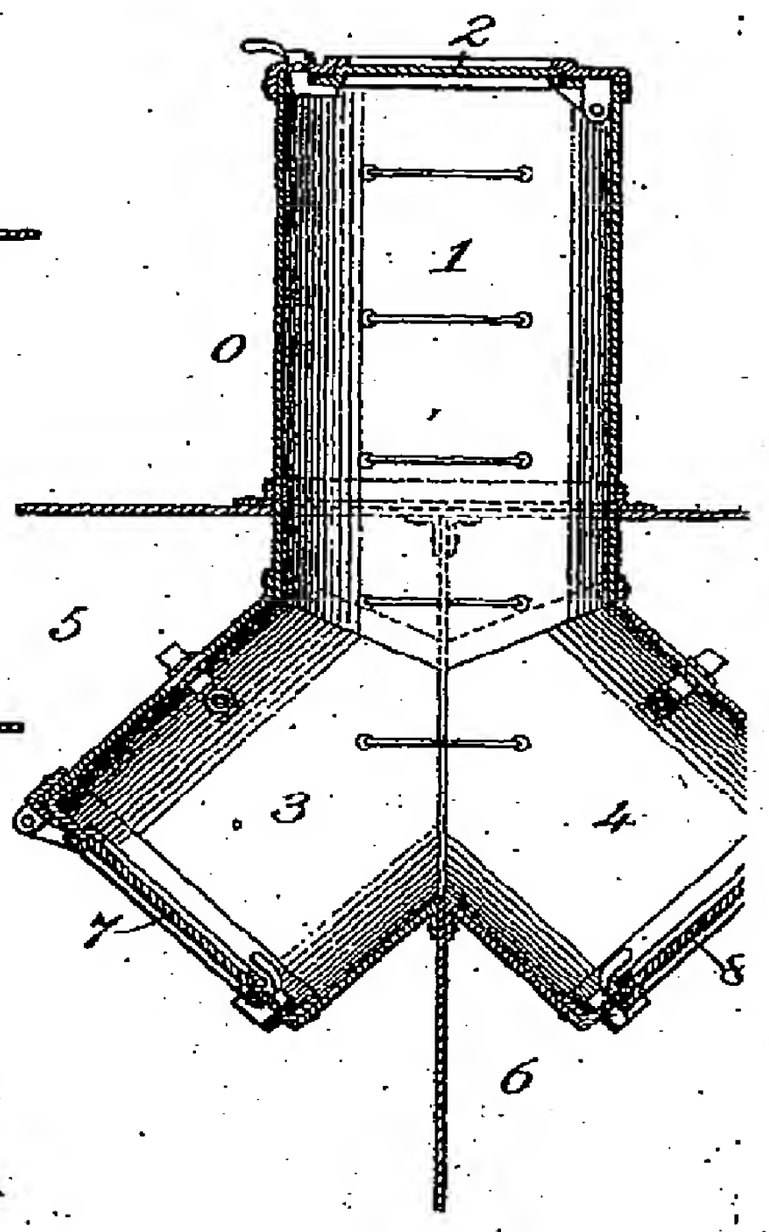

Fig. 1.

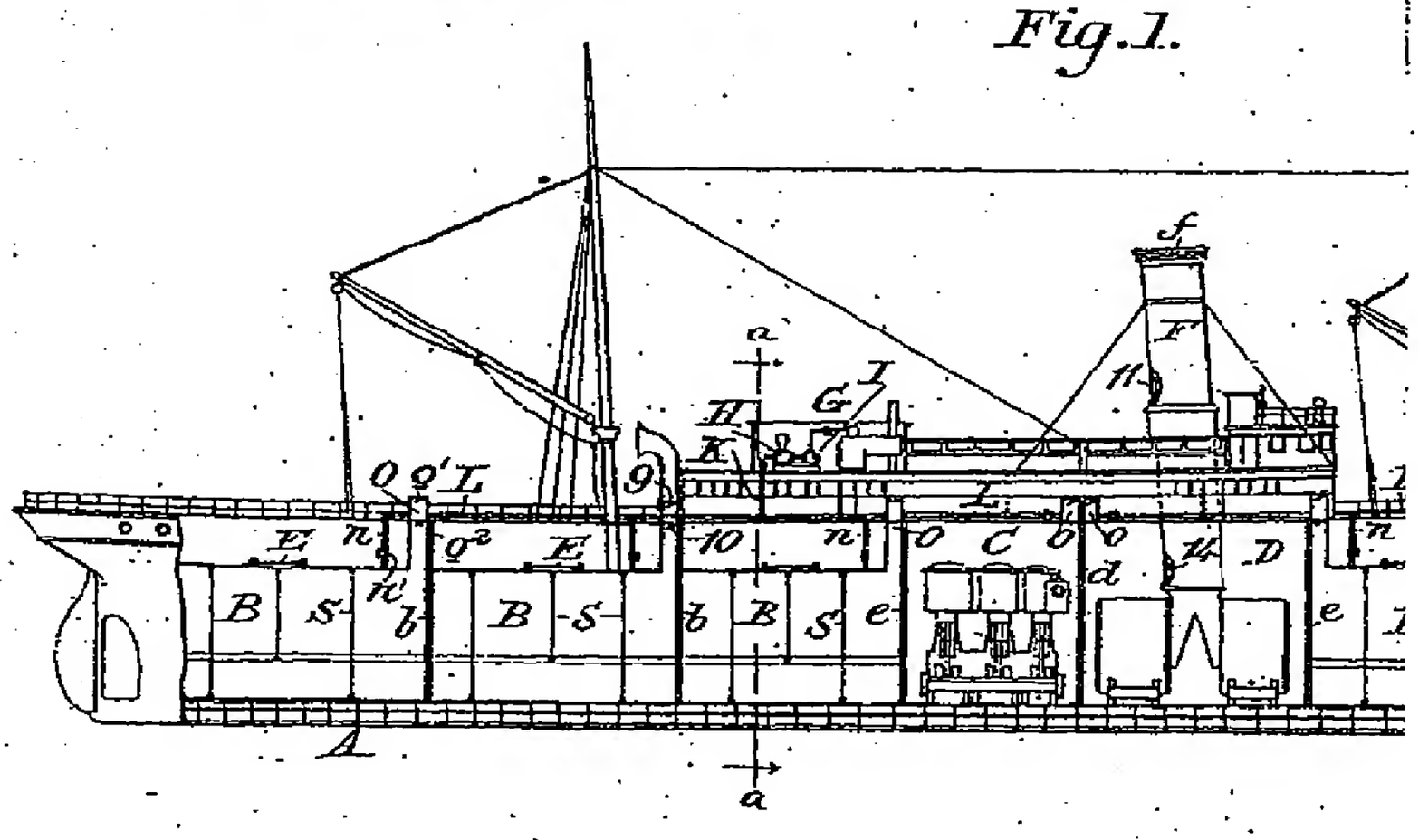

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Fig. 2.

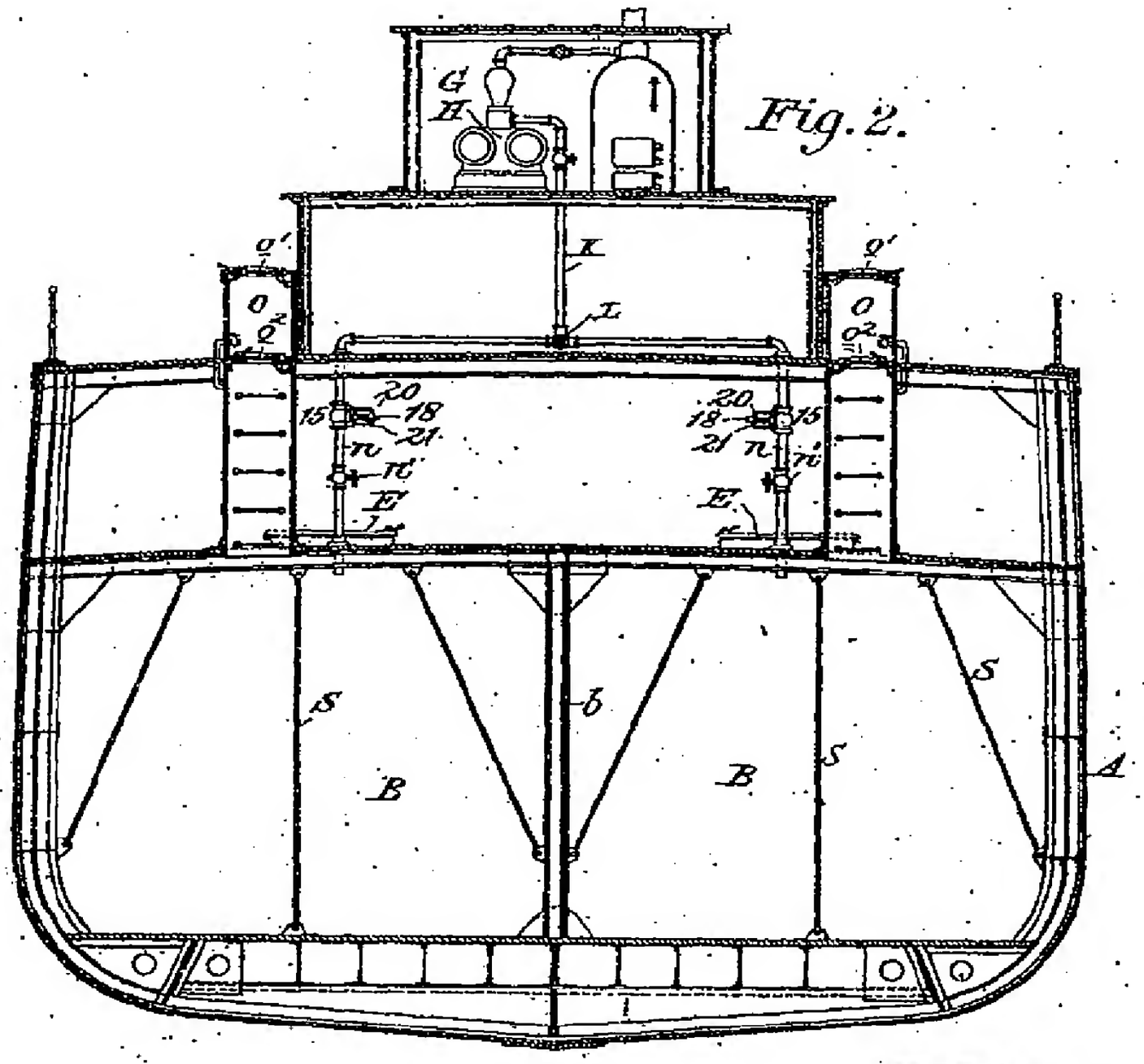

Fig. 6.

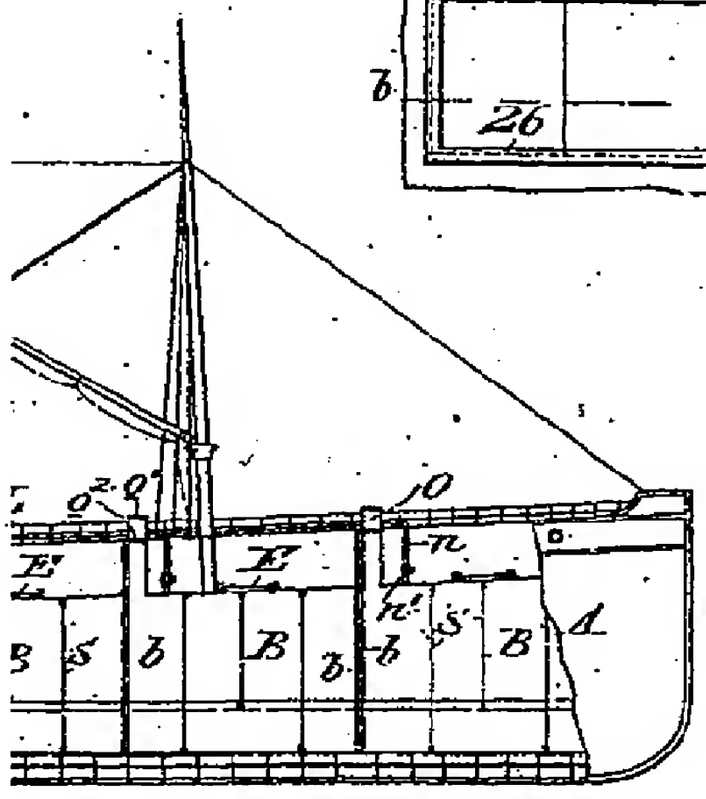

Fig. 5.

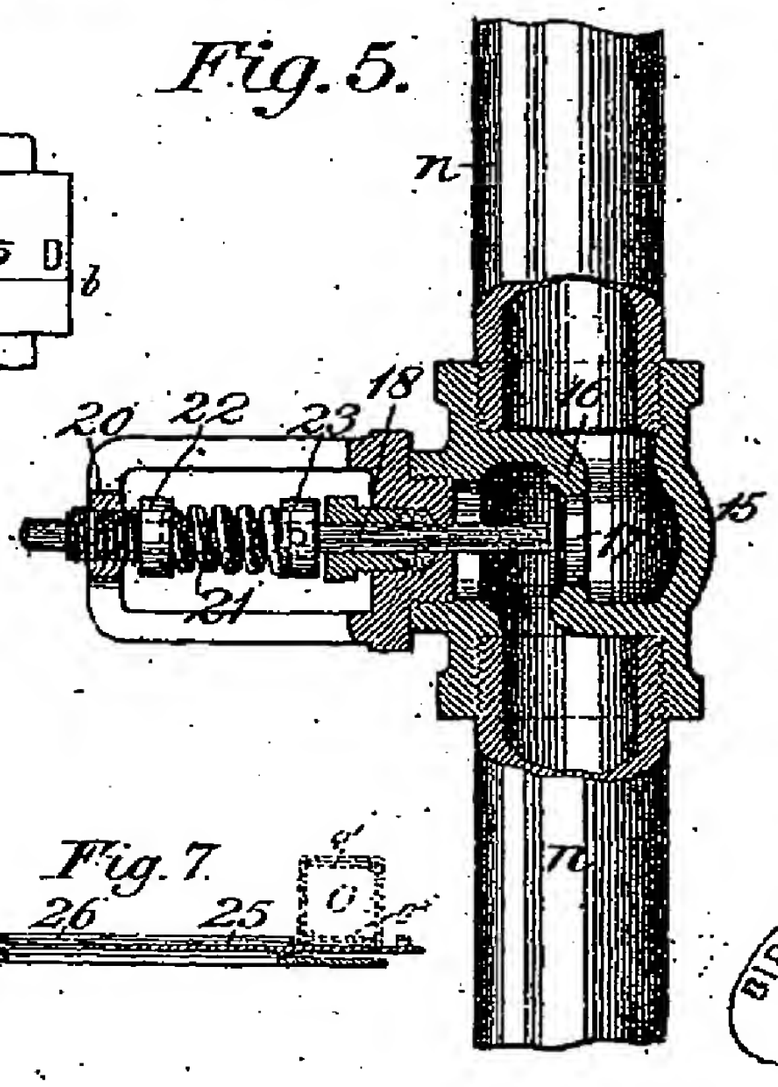

Fig. 7.

Melby & Sons, Photo-Litho.